3737 GP 3305

OIPE OCT 22 1998 PATENT & TRADEMARK OFFICE

TRANSMITTAL LETTER		Case No. 5050/296
Serial No. 08/746,360	Filing Date November 8, 1996	Examiner F. Jaworski	Group Art Unit 3305
Inventor(s) Ted Christopher		
Title of Invention Finite Amplitude Distortion Based Imhomogeneous Pulse Echo Ultrasonic Imaging		

TO THE ASSISTANT COMMISSIONER FOR PATENTS

Transmitted herewith is Second Protest Under 37 C.F.R. 1.291(A)1 (3 Pages) And Appendix A (7 Pages); Copy Of Averkiou Protest; Patent Office Form 1449 (2 Pages); Cited Art: Copies Of 4 U.S. Patents; 2 Foreign Patents; 7 Other Art; And, Postcard Receipt.

☐ Small entity status of this application under 37 CFR § 1.27 has been established by verified statement previously submitted.

☐ A verified statement to establish small entity status under 37 CFR §§ 1.9 and 1.27 is enclosed.

☐ Petition for a _____month extension of time.

☒ No additional fee is required.

☐ The fee has been calculated as shown below:

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Group 3700

	Claims Remaining After Amendment		Highest No. Previously Paid For	Present Extra	Small Entity Rate	Small Entity Add'l Fee	or	Other Than Small Entity Rate	Other Than Small Entity Add'l Fee
Total		Minus			x $11 =			x $22 =	
Indep.		Minus			x $41 =			x $82 =	
First Presentation of Multiple Dep. Claim					+ $135 =			+ $270 =	
					total add'l fee	$		total add'l fee	$

☐ Please charge Deposit Account No. 23-1925 (BRINKS HOFER GILSON & LIONE) in the amount of $_____. A duplicate copy of this sheet is enclosed.

☐ A check in the amount of $_____ to cover the filing fee is enclosed.

☒ The Assistant Commissioner is hereby authorized to charge payment of any additional filing fees required under 37 CFR § 1.16 and any patent application processing fees under 37 CFR § 1.17 associated with this communication or credit any overpayment to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.

☒ I hereby petition under 37 CFR § 1.136(a) for any extension of time required to ensure that this paper is timely filed. Please charge any associated fees which have not otherwise been paid to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

Joseph F. Hetz
Registration No. 41,070

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"Express Mail" mailing label number: EL130693348US
Date of Deposit: October 22, 1998

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Date of Deposit: October 22, 1998

Our Case No. 5050/296

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Ted Christopher	Examiner:	F. Jaworski
Serial No.:	08/746,360	Group Art Unit:	3305
Filed:	November 8, 1996		
For:	Finite Amplitude Distortion-Based Inhomogeneous Pulse Echo Ultrasonic Imaging		

SECOND PROTEST UNDER 37 CFR § 1.291 (a)[1]

Assistant Commissioner for Patents
Washington, D.C. 20231

ATTENTION: DIRECTOR OF GROUP 3300

Sir:

Since the filing of the August 13, 1998 protest, Acuson Corporation ("Acuson") has become aware of European Patent Application EP 0 851 241 A2 ("the Averkiou EPO application"). The Averkiou EPO application claims priority to U.S. Provisional Patent Application Serial Number 60/032,771 ("the Averkiou provisional application") and contains a citation to a 1994 dissertation of one of the inventors, Michalakis Averkiou. Copies of each of these references are enclosed. The filing date (November 26, 1996) of the Averkiou provisional application is later than the filing date (November 8, 1996) of the above-identified patent application ("the Christopher application").

[1] The 1997 amendment to 37 C.F.R. § 1.291(c) removed the blanket limitation of one protest per protestor and provided for a second or subsequent submission in the form of additional prior art. Acuson's August 13, 1998 protest was as complete as possible when filed. Since the filing of that protest, Acuson has become aware of the materials discussed herein.

On October 22, 1998, Acuson filed a protest ("the Averkiou protest") against any pending U.S. patent applications that claim priority to the Averkiou provisional application. Copies of the Averkiou protest and references filed therewith are enclosed. As discussed in the Averkiou protest, the Christopher application may claim the same invention as a pending U.S. patent application that claims priority to the Averkiou provisional application, as shown by the following comparison of Claims 1 and 10 in the Christopher PCT application with Claims 11 and 6, respectively, in the Averkiou EPO application. Appendix A of this protest contains a comparison of other similar claims.

The Christopher PCT Application	The Averkiou EPO Application
1. A method of imaging a sample comprising the steps of:	11. A method for producing an ultrasonic image from the harmonic response of the interior of the body comprising the steps of:
generating an ultrasonic signal; directing the ultrasonic signal into a sample, wherein the sample reflects the signal;	transmitting ultrasonic energy into the body at a fundamental frequency;
receiving the signal reflected by said sample, which received signal is distorted and contains a first order and higher order component signals at first and higher frequencies respectively;	receiving ultrasonic echo signals at a harmonic of said fundamental frequency; and
forming an image from one of said higher order component signals of the received distorted signal, including the step of removing from the received distorted signal the first order component thereof; and	processing said harmonic echo signals to produce ultrasonic image display signals; and
displaying said formed image.	displaying said ultrasonic image display signals.
10. A system according to Claim 9, wherein the means for removing the first order component from the received distorted signal includes a high-pass filter to filter the received, reflected distorted signal to remove therefrom the first order component thereof.	6. The ultrasonic diagnostic imaging system of Claim 5, wherein said filter comprises a programmable digital filter.

Acuson has a potential interest in acquiring rights in any patent maturing from the Christopher application and requests that the Examiner:

(1) review all pending claims to determine if an interference should be declared between the Christopher application and any pending U.S. patent application claiming priority to the Averkiou provisional application; and

(2) review the references cited on the enclosed PTO Form 1449, which lists the Averkiou EPO application, the Averkiou provisional application, the Averkiou dissertation, and the references filed with the Averkiou protest.

Additionally, Acuson hereby certifies that a duplicate copy of this Protest has been sent to Research Corporation Technologies, the owner of the Christopher application, by first class mail on October 22, 1998 at the following address:

Mr. Timothy Reckart, Esq.
General Counsel, Secretary and Director of Legal Affairs
Research Corporation Technologies
101 North Wilmot Road, Suite 500
Tucson, Arizona 85711-3335

Dated: October 22, 1998

Respectfully submitted,

ACUSON CORPORATION

Joseph F. Hetz
Registration No. 41,070

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The Averkiou EPO Application

1. An ultrasonic diagnostic imaging system for imaging the harmonic response of structure inside a body, comprising:

means for transmitting ultrasonic energy into the body at a fundamental frequency;

means, responsive to said transmitted ultrasonic energy, for receiving ultrasonic echo signals at a harmonic of said fundamental frequency; and

means for producing an ultrasonic image from said harmonic echo signals.

1. An ultrasonic diagnostic imaging system for imaging the harmonic response of structure inside a body, comprising:

means for transmitting ultrasonic energy into the body at a fundamental frequency;

means, responsive to said transmitted ultrasonic energy, for receiving ultrasonic echo signals at a harmonic of said fundamental frequency; and

means for producing an ultrasonic image from said harmonic echo signals.

1. An ultrasonic diagnostic imaging system for imaging the harmonic response of structure inside a body, comprising:

means for transmitting ultrasonic energy into the body at a fundamental frequency;

The Christopher PCT Application

9. A system for imaging a sample, comprising:

means for generating an ultrasonic signal;
means for directing the ultrasonic signal into a sample, wherein the sample reflects the signal;

means for receiving the signal reflected by said sample, which received signal is distorted and contains a first order and higher order component signals at first and higher frequencies respectively;

means for forming an image from one of said higher order component signals of the received distorted signal, said means for forming the image including means for removing from the received distorted signal the first order component thereof; and
means for displaying said formed image.

15. A system for imaging a sample, comprising:

means for generating an ultrasonic signal;
means for directing the ultrasonic signal into a sample, wherein the sample reflects the signal;

means for receiving the signal reflected by said sample, which received signal is distorted and contains a first order and higher order component signals at first and higher frequencies respectively;

means for forming an image from one of said higher order component signals of the received distorted signal; wherein said higher order component signals include a second order component, and the means for forming the image includes means for forming the image from said second order component; and
means for displaying said formed image.

19. A system for imaging a sample, comprising:

means for generating a series of ultrasonic pulse signals;
means for directing the ultrasonic pulse signals into a sample, wherein the sample reflects the pulse signals;

means, responsive to said transmitted ultrasonic energy, for receiving ultrasonic echo signals at a harmonic of said fundamental frequency; and

means for producing an ultrasonic image from said harmonic echo signals.

1. An ultrasonic diagnostic imaging system for imaging the harmonic response of structure inside a body, comprising:

means for transmitting ultrasonic energy into the body at a fundamental frequency;

means, responsive to said transmitted ultrasonic energy, for receiving ultrasonic echo signals at a harmonic of said fundamental frequency; and

means for producing an ultrasonic image from said harmonic echo signals.

1. An ultrasonic diagnostic imaging system for imaging the harmonic response of structure inside a body, comprising:

means for transmitting ultrasonic energy into the body at a fundamental frequency;

means, responsive to said transmitted ultrasonic energy, for receiving ultrasonic echo signals at a harmonic of said fundamental frequency; and

means for producing an ultrasonic image from said harmonic echo signals.

means for receiving the pulse signals reflected by said sample, which received pulse signals are distorted and contain a first order and higher order component signals at first and higher frequencies respectively;

means for forming an image from one of said higher order component signals of the received distorted pulse signals; and

means for displaying said formed image.

20. A system for imaging a sample, comprising:

means for generating an ultrasonic signal;

means for directing the ultrasonic signal into a sample, wherein the sample reflects the signal;

means for receiving the signal reflected by said sample, which received signal is distorted and contains a first order and higher order component signals at first and higher frequencies respectively;

means for forming an image from one of said higher order component signals of the received distorted signal; and

means for displaying said formed image;

wherein the sample is a biological sample.

22. A system for imaging a sample, comprising:

means for generating an ultrasonic signal;

means for directing the ultrasonic signal into a sample, wherein the sample linearly reflects the signal;

means for receiving the signal linearly reflected by said sample, which received signal is distorted and contains a first order and higher order component signals at first and higher frequencies respectively;

means for forming an image from one of said higher order component signals of the received linearly reflected, distorted signal; and

means for displaying said formed image.

5. The ultrasonic diagnostic imaging system of Claim 1, wherein said means for receiving ultrasonic echo signals at a harmonic of said fundamental frequency comprises a filter defining a passband which includes said harmonic frequency to the exclusion of said fundamental frequency.	10. A system according to Claim 9, wherein the means for removing the first order component from the received distorted signal includes a high-pass filter to filter the received, reflected distorted signal to remove therefrom the first order component thereof.
6. The ultrasonic diagnostic imaging system of Claim 5, wherein said filter comprises a programmable digital filter.	10. A system according to Claim 9, wherein the means for removing the first order component from the received distorted signal includes a high-pass filter to filter the received, reflected distorted signal to remove therefrom the first order component thereof.
9. The ultrasonic diagnostic imaging system of Claim 1, wherein said structure comprises naturally occurring structure of the body.	Claim 22 ("wherein the sample linearly reflects the signal")
10. The ultrasonic diagnostic imaging system of Claim 9, wherein said naturally occurring structure comprises tissue and cells of the body.	Claim 22 ("wherein the sample linearly reflects the signal")
11. A method for producing an ultrasonic image from the harmonic response of the interior of the body comprising the steps of: transmitting ultrasonic energy into the body at a fundamental frequency; receiving ultrasonic echo signals at a harmonic of said fundamental frequency; and processing said harmonic echo signals to produce ultrasonic image display signals; and displaying said ultrasonic image display signals.	1. A method of imaging a sample comprising the steps of: generating an ultrasonic signal; directing the ultrasonic signal into a sample, wherein the sample reflects the signal; receiving the signal reflected by said sample, which received signal is distorted and contains a first order and higher order component signals at first and higher frequencies respectively; forming an image from one of said higher order component signals of the received distorted signal, including the step of removing from the received distorted signal the first order component thereof; and displaying said formed image.
11. A method for producing an ultrasonic image from the harmonic response of the interior of the body comprising the steps of:	7. A method of imaging a sample, comprising the steps of:

transmitting ultrasonic energy into the body at a fundamental frequency;

receiving ultrasonic echo signals at a harmonic of said fundamental frequency; and

processing said harmonic echo signals to produce ultrasonic image display signals; and

displaying said ultrasonic image display signals.

11. A method for producing an ultrasonic image from the harmonic response of the interior of the body comprising the steps of:

transmitting ultrasonic energy into the body at a fundamental frequency;

receiving ultrasonic echo signals at a harmonic of said fundamental frequency; and

processing said harmonic echo signals to produce ultrasonic image display signals; and

displaying said ultrasonic image display signals.

11. A method for producing an ultrasonic image from the harmonic response of the interior of the body comprising the steps of:

transmitting ultrasonic energy into the body at a fundamental frequency;

receiving ultrasonic echo signals at a harmonic of said fundamental frequency; and

processing said harmonic echo signals to produce ultrasonic image display signals; and

generating an ultrasonic signal:

directing the ultrasonic signal into a sample, wherein the sample reflects the signal;

receiving the signal reflected by said sample, which received signal is distorted and contains a first order and higher order component signals at first and higher frequencies respectively;

forming an image from one of said higher order component signals of the received distorted signal; and

displaying said formed image;

wherein said higher order component signals include a second order component, and the forming step includes the step of forming the image from said second order component.

17. A method of imaging a sample, comprising the steps of:

generating a series of ultrasonic pulse signals;

directing the ultrasonic pulse signals into a sample, wherein the sample reflects the pulse signals;

receiving the pulse signals reflected by said sample, which received pulse signals are distorted and contain a first order and higher order component signals at first and higher frequencies respectively;

forming an image from one of said higher order component signals of the received distorted pulse signals; and

displaying said formed image.

18. A method of imaging a biological sample, comprising the steps of:

generating an ultrasonic signal;

directing the ultrasonic signal into the biological sample, wherein the sample reflects the signal;

receiving the signal reflected by said sample, which received signal is distorted and contains a first order and higher order component signals at first and higher frequencies respectively;

forming an image from one of said higher order component signals of the received distorted signal; and

displaying said ultrasonic image display signals.

11. A method for producing an ultrasonic image from the harmonic response of the interior of the body comprising the steps of:

transmitting ultrasonic energy into the body at a fundamental frequency;

receiving ultrasonic echo signals at a harmonic of said fundamental frequency; and

processing said harmonic echo signals to produce ultrasonic image display signals; and

displaying said ultrasonic image display signals.

14. The method of Claim 11, wherein the step of receiving ultrasonic echo signals at a harmonic of said fundamental frequency comprises passing received ultrasonic echo signals through a filter which passes signals at said harmonic of said fundamental frequency to the exclusion of said fundamental frequency.

Claims 35-38

Claims 39-42

43. An ultrasonic diagnostic imaging system for imaging the nonlinear response of tissue, comprising:

a transmitter for transmitting ultrasonic energy into the body at a fundamental frequency;

a receiver, responsive to echoes returned from tissue following said ultrasonic energy transmission, for separating signals representing the nonlinear response of tissue to ultrasound; and

displaying said formed image.

21. A method of imaging a sample, comprising the steps of:

generating an ultrasonic signal;

directing the ultrasonic signal into the biological sample, wherein the sample linearly reflects the signal;

receiving the signal linearly reflected by said sample, which received signal is distorted and contains a first order and higher order component signals at first and higher frequencies respectively;

forming an image from one of said higher order component signals of the received distorted signal; and

displaying said formed image.

2. A method according to Claim 1, wherein the removing step includes the step of high-pass filtering the received, reflected distorted signal to remove therefrom the first order component thereof.

Claims 11-14

Claims 9, 10, 15, 19, 20, and 22

9. A system for imaging a sample, comprising:

means for generating an ultrasonic signal;

means for directing the ultrasonic signal into a sample, wherein the sample reflects the signal;

means for receiving the signal reflected by said sample, which received signal is distorted and contains a first order and higher order component signals at first and higher frequencies respectively;

an image processor for producing an ultrasonic image from said nonlinear response signals.

means for forming an image from one of said higher order component signals of the received distorted signal, said means for forming the image including means for removing from the received distorted signal the first order component thereof; and

means for displaying said formed image.

43. An ultrasonic diagnostic imaging system for imaging the nonlinear response of tissue, comprising:

15. A system for imaging a sample, comprising:

a transmitter for transmitting ultrasonic energy into the body at a fundamental frequency;

means for generating an ultrasonic signal;

means for directing the ultrasonic signal into a sample, wherein the sample reflects the signal;

a receiver, responsive to echoes returned from tissue following said ultrasonic energy transmission, for separating signals representing the nonlinear response of tissue to ultrasound; and

means for receiving the signal reflected by said sample, which received signal is distorted and contains a first order and higher order component signals at first and higher frequencies respectively;

an image processor for producing an ultrasonic image from said nonlinear response signals.

means for forming an image from one of said higher order component signals of the received distorted signal; wherein said higher order component signals include a second order component, and the means for forming the image includes means for forming the image from said second order component; and

means for displaying said formed image.

43. An ultrasonic diagnostic imaging system for imaging the nonlinear response of tissue, comprising:

19. A system for imaging a sample, comprising:

a transmitter for transmitting ultrasonic energy into the body at a fundamental frequency;

means for generating a series of ultrasonic pulse signals;

means for directing the ultrasonic pulse signals into a sample, wherein the sample reflects the pulse signals;

a receiver, responsive to echoes returned from tissue following said ultrasonic energy transmission, for separating signals representing the nonlinear response of tissue to ultrasound; and

means for receiving the pulse signals reflected by said sample, which received pulse signals are distorted and contain a first order and higher order component signals at first and higher frequencies respectively;

an image processor for producing an ultrasonic image from said nonlinear response signals.

means for forming an image from one of said higher order component signals of the received distorted pulse signals; and

means for displaying said formed image.

43. An ultrasonic diagnostic imaging system for imaging the nonlinear response of tissue, comprising:

20. A system for imaging a sample, comprising:

a transmitter for transmitting ultrasonic energy into the body at a fundamental frequency;

means for generating an ultrasonic signal;

means for directing the ultrasonic signal into a

a receiver, responsive to echoes returned from tissue following said ultrasonic energy transmission, for separating signals representing the nonlinear response of tissue to ultrasound; and

an image processor for producing an ultrasonic image from said nonlinear response signals.

43. An ultrasonic diagnostic imaging system for imaging the nonlinear response of tissue, comprising:

a transmitter for transmitting ultrasonic energy into the body at a fundamental frequency;

a receiver, responsive to echoes returned from tissue following said ultrasonic energy transmission, for separating signals representing the nonlinear response of tissue to ultrasound; and

an image processor for producing an ultrasonic image from said nonlinear response signals.

44. The ultrasonic diagnostic imaging system of Claim 43, wherein said receiver includes a filter circuit for separating signals representing the nonlinear response of tissue to ultrasound.

Claim 45

Claim 46

sample, wherein the sample reflects the signal;

means for receiving the signal reflected by said sample, which received signal is distorted and contains a first order and higher order component signals at first and higher frequencies respectively;

means for forming an image from one of said higher order component signals of the received distorted signal; and

means for displaying said formed image;

wherein the sample is a biological sample.

22. A system for imaging a sample, comprising:

means for generating an ultrasonic signal;

means for directing the ultrasonic signal into a sample, wherein the sample linearly reflects the signal;

means for receiving the signal linearly reflected by said sample, which received signal is distorted and contains a first order and higher order component signals at first and higher frequencies respectively;

means for forming an image from one of said higher order component signals of the received linearly reflected, distorted signal; and

means for displaying said formed image.

10. A system according to Claim 9, wherein the means for removing the first order component from the received distorted signal includes a high-pass filter to filter the received, reflected distorted signal to remove therefrom the first order component thereof.

Claim 19

Claims 9, 15, 19, 20, and 22